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Correlated cerebral events between physically and sensory isolated pairs of subjects exposed to yoked circumcerebral magnetic fields

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ABSTRACT

In three different experiments pairs of unrelated people sitting in two different rooms were exposed simultaneously to different rates of circumcerebral rotations of weak, complex magnetic fields in order to produce "dynamic similarity". Quantitative electroencephalographic (QEEG) measurements were taken for one member of each pair in one room while the other sat in a closed chamber in another room and intermittently observed 5 Hz, 8 Hz, 10 Hz, or 15 Hz flashing lights. Reliable increases in QEEG power within specific frequencies over the right parietal region were observed during the similar-frequency light flashes when the shared temporal–spatial complexity of the circumcerebral rotating fields was based on 100 ms, the average duration of normal microstates. The development of this experimental procedure could facilitate rational understanding of this class of "coincidence" phenomena.

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Correlated dynamic changes within two spatially separated spaces occupied by mass were explained classically by the concept of fields [6] and more recently by entanglement [1]. The problem is becoming very relevant for modern neuroscience. Richards et al. [16] recently reported correlated brain signals during functional magnetic resonance imaging within Brodmann areas 18 and 19 for one pair but not all pairs of physically and sensory-isolated subjects. More than 40 years ago Duane and Behrendt [4] measured specific electroencephalographic activity (8–13 Hz, alpha rhythms) in 2 out of 15 pairs of monozygotic twins when one of the twins in a separate room was instructed to close his eyes. The primary limit to investigating this phenomenon has been the absence of an experimental paradigm. We report here that simultaneous production of two identical circumcerebral magnetic field configurations around the brains of separated pairs of unrelated, sensorially isolated people facilitates the phenomenon.

That a change in locus "A" is represented in locus "B" at a distance is not new and is embodied within both Nikola Tesla's [3] and Sheldrake's [18] "resonance" explanations. The former involves the movement of energy through space and matter. This "movement" is inferred when a change in current in one spatial configuration (the first coil) results in a representation of this change in a second, similar spatial configuration (a second coil). The latter presumes the existence of a resonance independent of distance and attenuation of power that occurs between two very similar or identically complex structures by virtue of this similarity.

The human brain is one of the most complex structural and dynamic organizations of biological matter. The volume of cerebral cortical space alone contains in the order of 10–100 billions of neurons [2] involving 10^{13} synapses [19]. When resonant clusters of microstates [7,9] with time frames in the order of 100 ms [5] are considered, the dynamic complexity within functional volumes of the brain may be sufficient to create a biological equivalent of Sheldrake's concept if a "shared complexity" to produce this resonance were created.

To test this hypothesis we experimentally induced this similarity of complexity in separate brains by exposing them to the same circumcerebral configuration of very complex magnetic fields [20,14,13] and then discerned if one brain would respond to frequency-specific optic stimulation of the other brain. We selected light-flashes as stimuli because Puthoff and Targ as reported in McTaggert [11] found that when one person was exposed to no light, a 6 Hz light, or a 16 Hz light, the electroencephalographic activity of a blindfolded person sitting in an electrically shielded room at some distance showed a decrease in the power of alpha activity (9–11 Hz) even though the subjects' subjective guesses about the light presentations displayed chance distribution. What we added was an experimental procedure to increase the congruence of the two brains.

The general procedure was identical to several previous, research ethics board approved, experiments [20,14]. In the first experiment a total of 12 people (6 pairs) served as subjects; only one

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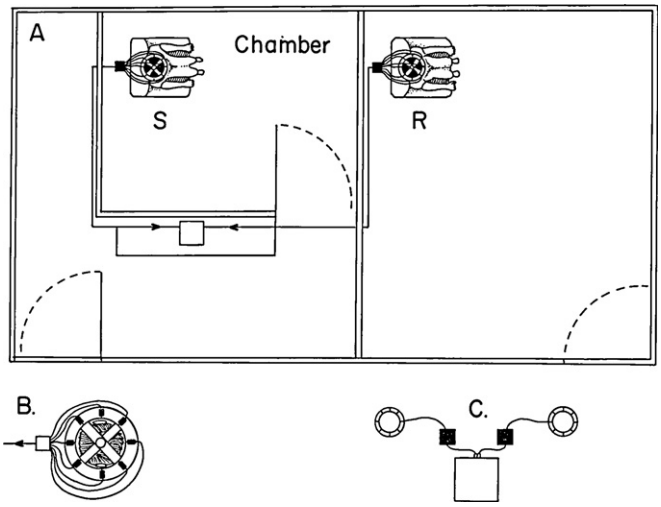

Fig. 1. Schematic of the experimental design. The stimulus person (S) sat within a closed, darkened, electrically shielded acoustic chamber while Person R (whose quantitative EEG was recorded) sat in another room. Both subjects received the identical complex circumcerebral magnetic field, (B) at any given time (C).

pair was tested per week. These 6 male and 6 female university students (ages 18–25) were not related and were strangers before they arrived, as volunteers for a "relaxation study", at the laboratory. For each pair (male and female) one was randomly assigned for the EEG measurements (the response person; 3 male, 3 female) while the other (stimulus person) was placed in an electrically shielded industrial acoustic chamber. Both rooms contained comfortable arm chairs that were facing eastward. The linear distance between the two chairs (and subjects) was 5 m; they were separated by a double metal wall (the acoustic chamber) and the structural wall separating the rooms. A schematic of the experimental area and arrangement is shown in Fig. 1.

While one experimenter placed EEG sensors over positions F7/F8, T3/T4, P3/P4 and O1/O2 on the scalp of the response person another experimenter facilitated the comfort of the stimulus person within the acoustic chamber. This person was told to maintain perceptual direction to a spot directly in front and not to look directly at a dim green light (about 10 lux) that would be activated intermittently. The light (45° to the left and 10° above the horizontal plane) was located 1 m from the subject so that it would stimulate primarily the left peripheral visual field [17]. One circumcerebral array of 8 solenoids was placed around the head of the stimulus person. They were equally spaced, separated by 45°, and adhered in the horizontal plane just above the ears of the subject to a band of Velcro. Once the EEG sensors had been applied to the response person a second, identical array of 8 solenoids was placed around the head. The response person was blindfolded and wore disposable earplugs to minimize the effects of visual and auditory input on the EEG activity which was recorded in a third room.

Six configurations (designed to overlap with microstates) of the rotational component of the fields (200−20 ms, 100−10 ms, 20−2 ms, 200+20 ms, 100+10 ms and 20+2 ms) were presented simultaneously for 5 min each to both members of a pair [13,10]. The first value referred to the initial duration (in ms) of the field in the first solenoid (left frontal) while the second value referred to the vector of the rate of change. For the 100 +10 ms pattern, for example, this meant that the first solenoid (left frontal) was activated for 100 ms, the second one for 90 ms, etc. For the 100 −10 ms pattern, this meant the first solenoid was activated for 100 ms, the second one for 110 ms, the third one for 120 ms, etc.

Two minutes after the initiation of a new field pattern a baseline EEG was taken for 20 s. About 10–15 s later the stimulus person was told quietly by internal speaker through an external microphone that the light would be activated and to stare straight ahead. The green light was activated for 40 s during which time a second 20 s sample of the EEG was taken by the EEG experimenter in the other room by sliding a paper under the door. Limitations of the equipment restricted the light flash to 8.3 Hz.

The monopolar (referenced to ear) signals from each of the eight channels were recorded digitally by Labview software (for the 20 s bins) at a sampling rate of 1000 Hz. Hard copies of the EEG were recorded simultaneously by a Grass 20 channel unit to monitor any obvious artifacts that might contaminate the power measurements (there were none). Based upon theoretical rationales [12] raw data for increments of 1 Hz were collected for 6 successive bins between 3.0 Hz and 3.9 Hz and 8.0 and 8.9 Hz by using Fast Fourier Analysis Software as specified previously [20,14,13]. This band range included the frequency of the light stimulus (8.3 Hz).

Power data (μV^2/Hz) for each of the 20 s segments for each of the 6, 1 Hz bands for each of the six rotational configurations for the baseline period and for the period when the light was flashing were transferred to a VAX 4000 computer. The intercorrelations between the power values for the 32 combinations for the 8 EEG electrode positions for the 72 samples for the 6 subjects were completed by SPSS software. The numbers of statistically significant ($p < .05$) correlations between brain areas (r values > .90) for the baseline and light stimulus intervals (all dfs = 5) were computed. Sample configurations were mapped for demonstration.

The most conspicuous change between baseline and light-flashing condition occurred when both subjects of a pair were exposed to the 100 −10 ms rotational condition. In fact the most robust effect was within the 8–9 Hz range EEG activity, the range associated with the 8.3 Hz flashing light being observed by the stimulus persons at the same time the EEGs were being measured for the response persons in a separate room. The effect was most obvious over the right parietal lobes for all 6 response persons. The five other configurations did not show this effect.

Fig. 2 shows the mapping of the significant intercorrelations of power over the eight sensor positions for the response persons during the baseline and light-flashing exposures for the stimulus persons when the 100 −10 configuration was applied (Fig. 2A). However when the stimulus persons watched the 8.3 Hz light flashes while the EEGs of the response persons were measured there was a marked decrease in transcerebral coherence (Fig. 2B). The most conspicuous change was the desynchrony, classically interpreted as increased activation, over the right hemisphere

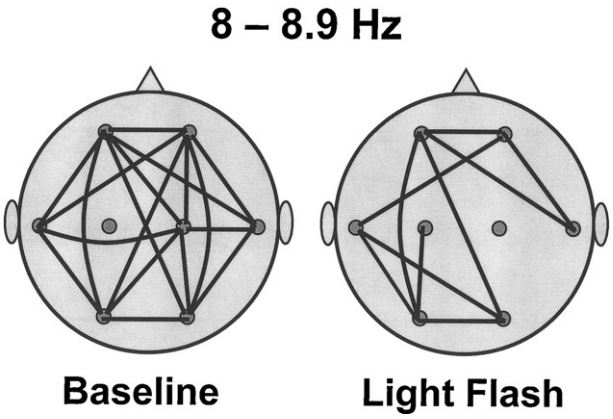

Fig. 2. Averaged correlations ($rs > 0.90$) between the power within the 8.0–8.9 Hz band for the eight cerebral positions of the frontal, temporal, parietal, and occipital lobes of the response persons during 20 s baseline and when a 8.3 Hz dim green light flash was presented for 20 s to the left peripheral visual fields of the stimulus persons.

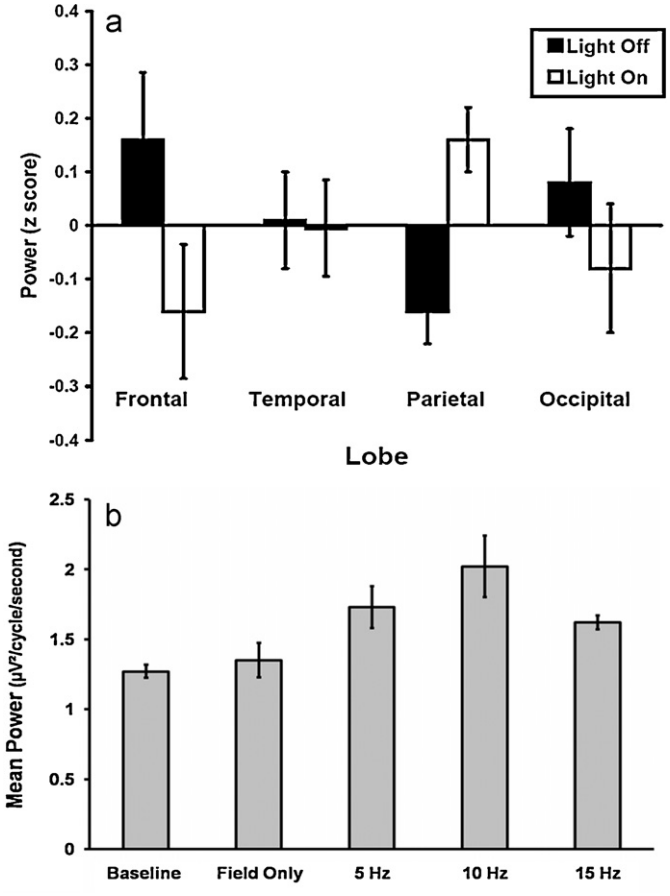

Fig. 3. (a) Experiment 1. Averaged standardized power changes within the 8–9 Hz range over the four lobes of 6 subjects while their paired partners watched 8.3 Hz dim light flashes or no flashes. Both members of the pairs were exposed simultaneously to circumcererbal weak magnetic fields with initial durations of 100 ms. The effect was not seen with fields involving 200 ms or 20 ms initial durations. (b) Experiment 2. Mean power within the 10–13 Hz frequency band over the parietal lobe of the response person while the stimulus person in the acoustic chamber viewed either 5 Hz, 10 Hz, or 15 Hz white light. For comparison the power during baseline (no field or lights) and when the field was operating around both subjects is shown. Vertical bars indicated standard errors of the mean.

(particularly the parietal lobe). The other five conditions did not produce any effect that was not similar to baseline. EEG activity during presentations of the light stimulus without the shared magnetic fields did not differ significantly from the no light condition.

According to the within subject (repeated measure) analyses of variance for *z*-scores (employed to "normalize" interlobe differences) of the power measures as a function of hemisphere, lobe, base duration (200, 100, 20 ms) and acceleration (+) or slowing (−) rates of change for the 8–9 Hz band, the most powerful effect (partial eta-squared = 60% of variance explained) was an interaction between the base duration and lobe. As shown in Fig. 3a, there was an increase in the power within the 8 Hz and 9 Hz range over the parietal lobes of the response persons when the 8.3 Hz light flash was presented to the stimulus persons. However this power over the frontal lobes decreased. A change in standardized score of about 0.3 *z* was equivalent to about 2 μV^2/Hz.

In the second experiment we replicated the strength of the effect produced in the first experiment with a single pair of subjects tested over several days. The naive single stimulus subject was exposed to 4 random presentations each of 5 Hz, 10 Hz, and 15 Hz flashes. These white light flashes (originating from a LED flashlight behind the head of the subject) illuminated the entire chamber and were reflected on the opposite wall of the chamber; however, the reflective intensity observed by the viewer was about 1 lux. The frequencies were driven by a Heath–Schlumberger function generator that was controlled from outside of the chamber.

To enhance synchrony the experimenter who controlled the light flash frequencies to the stimulus person and who sat outside the acoustic chamber was connected by telephone to the operator of the EEG who was in a different room than the blindfolded response person whose measurements were taken (in this experiment the stimulus and response persons were separated by 10 m). Consequently the QEEG data could be collected more precisely during the 30 s immediately before and the 30 s of the light presentations.

The only statistically significant effect [$F(4,15) = 5.92$, $p < .01$; eta-squared = .68] for the five way analysis of variance involving this more spatially inclusive white light with different frequencies was for the 100 +10 ms configuration. The primary change occurred within the high alpha (10–13 Hz) range over the right parietal lobe of the response person. The means and standard errors of the mean for the power during baseline (no field), field (rotating magnetic field but no light flashes) and during the presentation of the 5 Hz, 10 Hz, or 15 Hz light are presented in Fig. 3b. Post hoc analysis indicated that the significant differences were due in large part to the power increase in the response person while the stimulus person was observing the 10 Hz flashed compared to the 15 Hz flash, the field only, or baseline (no field) conditions.

In response to reviewers' requests the procedure was replicated a third time by a third group of researchers and three additional pairs of subjects. This time an electrode cap with 19 sensors (<10 kΩ) connected to a Mistar 201 system with WINEEG v2.82 software was employed for the response subjects and the stimulus subjects received 5 Hz, 8 Hz, 10 Hz and 15 Hz light flashes in various orders during the same 100 +10 or 100 −10 ms duration shared rotations. A multilevel analysis of variance showed only one statistically significant interaction between rotation, light

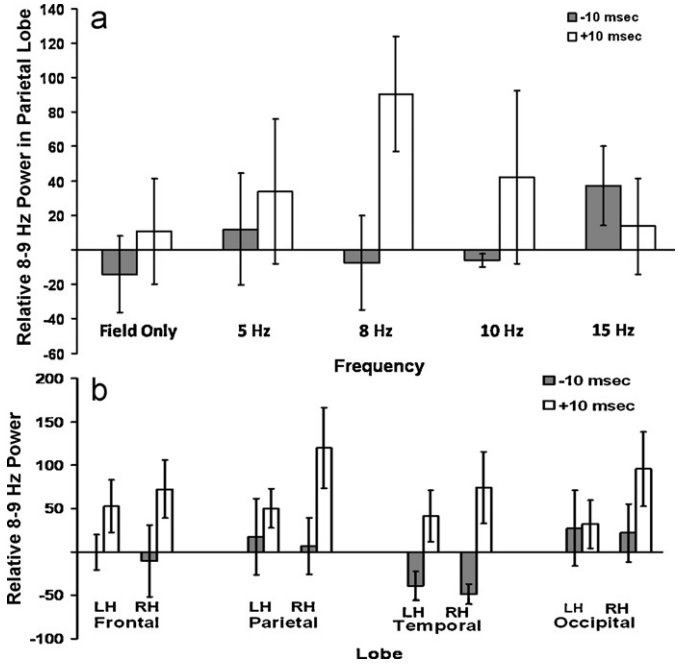

Fig. 4. Experiment 3. (a) Relative changes in power within the 8–9 Hz band over the right parietal lobe of the response persons as a function of the light flash frequency presented to the stimulus persons relative to the previous no light intervals. Note the significant enhancement with 8 Hz flashes during shared accelerating circumcerebral fields. (b) Relative changes in power within the 8 Hz increment band during the 8 Hz flash condition over the lobes of the left and right hemisphere. Vertical bars are SEMs.

frequency, hemisphere and lobe within the 8–8.9 Hz power band for the 8 Hz light flash primarily over P4 and T4 positions that was most conspicuous with the accelerating (100 +10) angular velocity (see Fig. 4).

The results of these experiments indicate that when randomly selected people share a specific complex, circumcerebral rotating magnetic field a visual stimulus presented to one person affects specific QEEG activity of the other even though they are sensorially isolated in different rooms. In all experiments the right parietal region was most responsive and showed a relationship with the temporal characteristics (frequency) of the light flashed to the stimulus persons. The sensitivity of the theta–alpha range to these "coincidence effects" has been shown by several experimenters [16,4,11] and is evident even by examination of strip chart recordings [4,8].

One explanation for these effects is the superimposition of the 100 ms durations of complex rotating circumcerebral magnetic fields around two brains simultaneously encouraged a synchronization of microstates [7,9] for the members of the pair. These states are manifested as globally consistent polarities and voltages with durations between 80 and 120 ms (about 10 Hz) and approximate the concept of "now" [5]. We suggest that application of the identical circumcerebral fields synchronized the complexity to produce the degree of similarity sufficient to simulate the natural conditions associated with transient cerebral states of monozygotic twins and Sheldrake's morphogenic fields. If our inferences and theoretical assumptions [15] are valid then this may be an experimental procedure to manipulate the stimulus–response coincidence between two brains separated by distance.

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